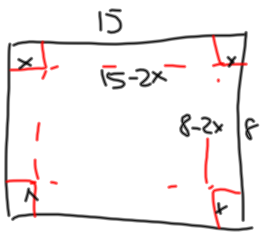
Find the max volume of a box by . . .

(1) $8 \times 15$ in rect.

$0 < x < 4$




$V = x(15-2x)(8-2x)$ (1)

$= x(120 - 46x + 4x^2)$

$= 4x^3 - 46x^2 + 120x$

$V' = 12x^2 - 92x + 120$ (1)

$\underline{3 \times 30 = 90}$ (+)

1 · 90 91

2 · 45 47

3 · 30 33

5 · 18 23

$= 4(3x^2 - 23x + 30)$ (+1)

$= 4(3x - 5)(x - 6)$

(1) (1)

$\Rightarrow x = \frac{5}{3}, 6$ not in domain

V

+ + + | − −

$\frac{5}{3}$

max at $x = \frac{5}{3}$ (1)

Volume (max) $= \frac{5}{3}\left(15 - \frac{10}{3}\right)\left(8 - \frac{10}{3}\right)$ (1)

(+1) V is a max at $x = \frac{5}{3}$, since V(x) increases to $\frac{5}{3}$ and decreases after.

x can be no larger than 4 ($\frac{1}{2}$ of 8) so $x = 6$ is exclud

23b)

$$r = \frac{4995}{1+0.12\cos\theta} = 4995(1+0.12\cos\theta)^{-1}$$

$$\frac{dr}{dt} = 4995\left(-(1+0.12\cos\theta)^{-2}(-0.12\sin\theta)\frac{d\theta}{dt}\right)$$

$$= \frac{4995 \cdot 0.12 \sin\theta \frac{d\theta}{dt}}{(1+0.12\cos\theta)^2}$$

when
$\theta = 120^\circ$
$\cos\theta = -\cos 60^\circ$
$\sin\theta = +\sin 60^\circ$
$\sin 60^\circ = \frac{\sqrt{3}}{2}$
$\cos 60^\circ = \frac{1}{2}$

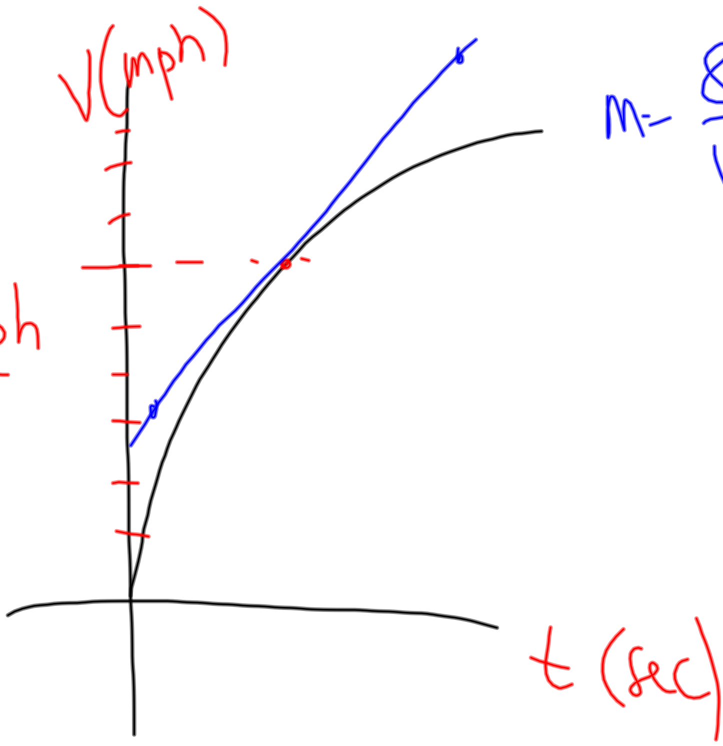
$\frac{d\theta}{dt} = 2.7^\circ/\text{min} = (2.7)\cdot\frac{\pi}{180}\frac{\text{rad}}{\text{min}}$

$$= \frac{(4995)(0.12)\left(\frac{\sqrt{3}}{2}\right)(2.7)\left(\frac{\pi}{180}\right)}{\left[1+0.12\left(-\frac{1}{2}\right)\right]^2}$$

$=$

5.4/9)

a) accel. at 60 mph




$m = \frac{80}{15} \frac{mph}{sec}$

$$\frac{\frac{80\,mi}{15\,hr}}{1\,sec} \cdot \frac{5280\,ft}{1\,mi} \cdot \frac{1\,hr}{3600\,sec} = 7.822\,\frac{ft}{sec^2}$$

5.6/1

Sum of two numbers is 10.

$$x+y=10$$

Product of 2 numbers $[P=xy]$ is a maximum when?

① Equation always true

$$P=xy=x(10-x)=10x-x^2$$

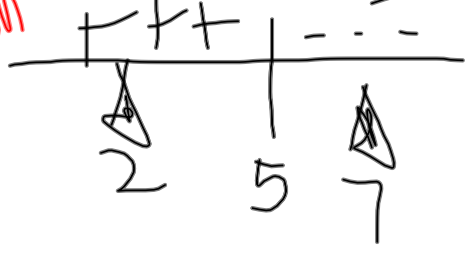
② Derivative

$$P'=10-2x=0$$

③ sign chart

$$\Rightarrow x=5$$

④ conclusion




$\therefore$ $x=5$ is when $P$ is a max